USDA Natural Resources Conservation Service

Ecological site F094DY013WI
Loamy-Mantled Terraces And Plains

Accessed: 05/19/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

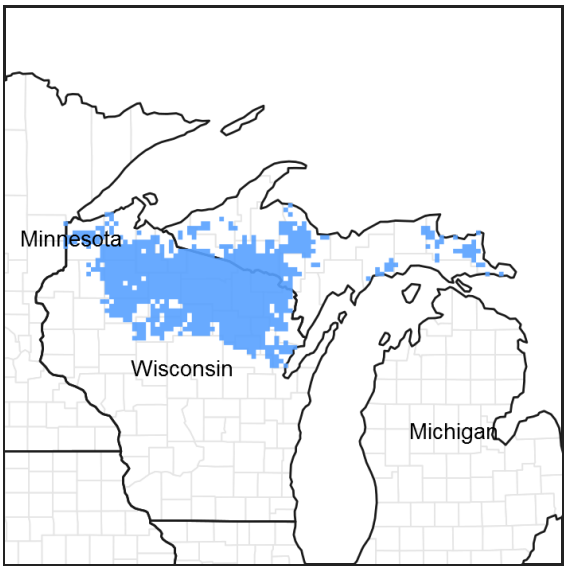


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 094D–Northern Highland Sandy Pitted Outwash

The Loamy-Mantled Terraces and Plains ecological site occupies about 15,000 acres in MLRA 94D

Classification relationships

The Loamy-Mantled Terraces and Plains ecological site correlates to a hybrid of ATM and ATD habitat types developed by Kotar and Burger (2002); these habitat types are named after Acer saccharum (sugar maple)- Tsuga canadensis (eastern hemlock)/ Maianthemum canadense (Canada mayflower) and Acer saccharum (sugar maple)-Tsuga canadensis (eastern hemlock)/ Dryopteris spinulosa (spinulose shield fern), respectively. These species have very high constancy value relative to this site, i.e. they are present on a higher percentage of these sites than other species. This ecological site has a mesic moisture regime and is medium in nutrients.

Ecological site concept

ATTENTION: This ecological site meets the NESH 2014 requirements for PROVISIONAL. A provisional ecological site is established after broad ecological site concepts are identified and an initial state-and-transition model is drafted. Following quality control and quality assurance reviews of the ecological site concepts, an identification number and name for the provisional ecological site are entered into ESIS. A provisional ecological site may include literature reviews, land use history information, some soils data, legacy data, ocular estimates for canopy and/or

species composition by weight, and even some line-point intercept information. A provisional ecological site does not meet the NESH 2014 standards for an Approved ESD, but does provide the conceptual framework of soil-site correlation for the development of the ESD. For more information about this ecological site, please contact your local NRCS office.

The Loamy-Mantled Terraces and Plains ecological site is the richest non-wet site in the region. The loamy mantle is 10 to 40 inches thick consisting primarily of sandy loam, loam or silt loam. The loamy mantle increases both water-holding capacity and fertility compared to the sandy ecological sites. This site occurs on nearly level slopes typically found between steeper areas and low-lying areas. If the site occurs as a narrow band it resembles a terrace, if it occurs as a broad expanse, roughly equal in all directions from a central point, then it is called a plain. The vegetation is mixed hardwood and conifer forest, with sugar maple and eastern hemlock common associates in climax communities. In the undisturbed state, the understory is often low-growing and dominated by shade-tolerant ferns, club mosses and spring ephemerals because the forest canopy is so dense.

Associated sites

F094DY010WI	**Wet Sandy Depressions** Loamy-Mantled Terraces and Plains are typically adjacent to Loamy-Mantled Uplands.
F094DY012WI	**Steep Loamy-Mantled Ridges** Loamy-Mantled Drainageways frequently occur downslope from Loamy-Mantled Terraces and Plains.

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Tsuga canadensis*
Shrub	(1) *Lonicera canadensis* (2) *Diervilla lonicera*
Herbaceous	(1) *Dryopteris spinulosa* (2) *Trientalis borealis*

Physiographic features

This nearly level to gently sloping ecological site is typically found on linear to convex slopes ranging from 0-6% between the upland (7 to 16%) or steeper sites (>16% slopes) and the low-lying drainageway or depressional sites. Loamy mantled soils with sandy substrata can occur on outwash plains, outwash terraces, and pitted outwash plains due to thin local loess, lacustrine or stream deposits which were laid atop the outwash. When the site occurs as a narrow band it resembles a terrace, if it occurs as a broad expanse, roughly equal in all directions from a central point, then it is called a plain. These sites often receive some subsurface lateral water flow from the uplands, which generally causes higher forest productivity on these sites.

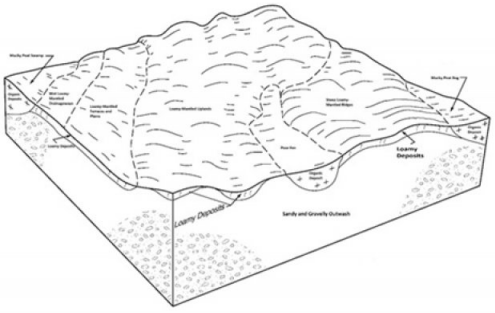


Figure 2. Loamy-Mantled Terraces and Plains

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Outwash terrace (3) Pitted outwash plain
Elevation	358–567 m
Slope	0–18%
Water table depth	61–168 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is humid continental with very cold winters and warm summers. As is common across northern Wisconsin, two-thirds of the precipitation falls as rain during the relatively short growing season of late May to early September. Most of the rainfall is transpired by plants. Snow cover is likely in the months of November through April. Snow cover prevents deep frost penetration which promotes groundwater recharge.

Table 3. Representative climatic features

Frost-free period (average)	96 days
Freeze-free period (average)	123 days
Precipitation total (average)	864 mm

Climate stations used

- (1) LONG LAKE DAM [USC00474829], Eagle River, WI
- (2) NORTH PELICAN [USC00476122], Rhinelander, WI
- (3) REST LAKE [USC00477092], Manitowish Waters, WI
- (4) WILLOW RSVR [USC00479236], Hazelhurst, WI

Influencing water features

This site is not a wetland. However, there is periodic soil saturation typically below 40 inches (1 meter) on this site.

Soil features

The Loamy-Mantled Terraces and Plains also have variable thickness of loamy-mantles. However, the variability is greater between sites than is within the site. In other words, the thickness of loamy-mantles is relatively uniform within any given site. The difference between sites arises due to mode of deposition and proximity to loamy parent materials. Thinner loamy-mantles are in or around areas with more outwash plain deposits, and thicker deposits are associated with or adjacent to till deposits on moraines. The effect of thicker loamy-mantles and/or mantles with higher percentages of silt and clay is to increase water-holding capacity and cation exchange capacity producing a richer, more productive site. Soils with thinner loamy-mantles are represented by the Manitowish soil series, and the thicker ones are Tipler soils. Both of these soils are spodosols with a well developed horizon sequence of O-E-Bhs-Bs, where the surface is undisturbed. Disturbances like windthrow or tree tipping will mix these horizons. Man-made disturbances such as logging or farming, as well as the introduction of earthworms, also mixes the surface horizons to form A horizons or in some cases A/E horizons in which remnants of the former E horizon are clearly visible. In some cases, the former E horizon is solely represented by an abundance of uncoated, white-colored sand grains in an otherwise dark-colored A horizon.

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Fine sandy loam (3) Loam

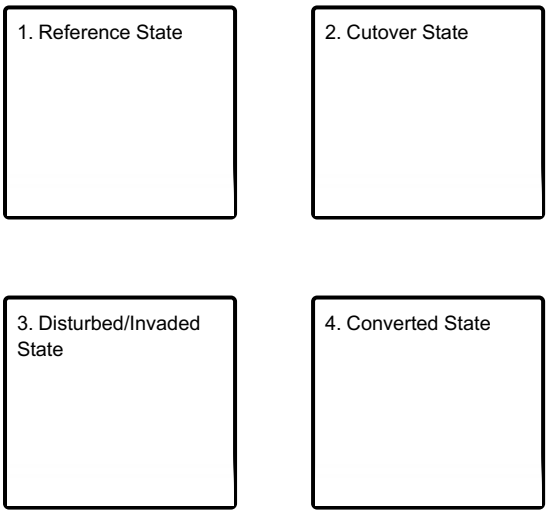
Family particle size	(1) Sandy
Drainage class	Moderately well drained
Permeability class	Moderately rapid to rapid
Soil depth	203 cm
Surface fragment cover <=3"	2–10%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	10.16–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–6.2
Subsurface fragment volume <=3" (Depth not specified)	10–20%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The Loamy-Mantled Terraces and Plains ecological site is capable of producing a variety of forest cover types. The site has a mesic moisture regime and a medium level of nutrients which provides potential habitat for most of the tree species found in the region. Thus the disturbance history of the site is the main determining factor for which species will be found on any given site. Sites with a low disturbance frequency will likely have an old-growth sugar maple, hemlock and yellow birch stand. On sites at the other end of the disturbance gradient are stands with quaking aspen, paper birch, and balsam fir. It is not uncommon to find stands with mix of early, mid and late successional species which includes red oak and white pine, indicating a diverse and complicated disturbance history. Therefore, the understory species are more indicative of the true productivity of the site.

State and transition model

Ecosystem states



State 1 submodel, plant communities

1.1. Early Seral Phase

1.2. Mid Seral Phase

1.3. Climax Phase

State 2 submodel, plant communities

2.1. Quaking Aspen-Balsam Fir Phase

2.2. Red Maple-White Pine Phase

2.3. Sugar Maple-Basswood Phase

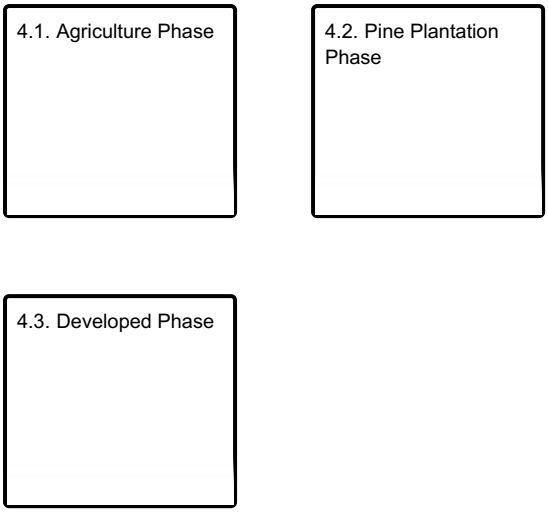
State 3 submodel, plant communities

3.1. Earthworm Phase

3.2. Invasive Weeds Phase

3.3. Recent Logging Phase

State 4 submodel, plant communities



State 1
Reference State

The Reference State of the Loamy-Mantled Terraces and Plains ecological site has been replaced by the Cutover State, which is mainly the second- or third-growth, mesic hardwood forest with a few white pines leftover.

Community 1.1
Early Seral Phase

This phase is dominated by early successional tree species, but the understory is heavily weighted toward conifers. This will cause the herbaceous understory to be rather sparse.

Community 1.2
Mid Seral Phase

Conifers will emerge as the deciduous overstory fades. Red maple will be common in the understory and rapidly occupy gaps. Red oak is also associated with this site, because it is moderately shade tolerant and will outlast other species in competition for resources. Large seeds (acorns) make oak seedlings highly effective competitors with understory species.

Community 1.3
Climax Phase

This phase is dominated by shade tolerant, long-lived species such as sugar maple and eastern hemlock. Sunlight is a limiting resource for the understory.

State 2
Cutover State

The Cutover State was the most common state following the logging boom. Most sites regenerated quickly to early successional species like quaking aspen, or understory species like balsam fir were released as the canopy was removed. Tree species found in the pre-logging era climax forests, such as eastern hemlock and white pine, have not returned to their former numbers.

Community 2.1
Quaking Aspen-Balsam Fir Phase

This phase is the first stage of forest regeneration following the vast clear-cut that occurred during the logging boom. Aspen colonization of pineries was likely when the newly logged areas were burned; the logging slash was highly inflammable, especially under drought conditions. Aspen volume has been maintained by recent logging and old field succession.

Community 2.2
Red Maple-White Pine Phase

This phase followed the initial pioneer phase. These species are more shade tolerant than the pioneer species and replaced the pioneer species in the canopy as those early died off. Alternatively, red maple and white pine were released when the old growth canopy was logged off. These trees then became seed trees for a new stand. Aspen colonization of pineries was likely when the newly logged areas were burned; the logging slash was highly inflammable, especially under drought conditions.

Community 2.3
Sugar Maple-Basswood Phase

Long-term disturbance free conditions allowed the site to become dominated by shade tolerant mesic hardwoods. Conifers can be locally abundant, but sugar maple has become the most common species on this site. The generic term 'northern hardwoods' is commonly applied to this cover type, especially if there has enough small-scale disturbance to decrease sugar maple dominance and increase the presence of basswood, white ash, and red oak.

State 3
Disturbed/Invaded State

This state has gradually become the most abundant state on this site. The cover types or land uses (community phases) are similar to the Cutover State or the Converted State. However the predominance of exotic species such as earthworms or weeds makes this state noteworthy as a separate entity.

Community 3.1
Earthworm Phase

The earthworm phase is increasingly common. This phase exhibits several unfortunate traits when compared to sites without worms. These sites generally have reduced species richness, and more exposed mineral soil which makes subject to erosion.

Community 3.2
Invasive Weeds Phase

This phase has been invaded by weeds that crowd out native species. Some invasive species are known to release chemicals which inhibit native species. Native species are preferred for several reasons, some of those reasons involve economics, some are aesthetic, but mainly there are sound ecological reasons. The main ecological reasons involve productivity, nutrient cycling and energy flow. However, the bottom line once again, is that negative impacts on ecological factors tends to have economic consequences for people. Unless and this is even more fundamental, there are negative health consequences for people.

Community 3.3
Recent Logging Phase

Logging done with best management practices is typically neutral to somewhat beneficial for the site. Under a less careful regime, logging can be harmful to the site by lowering future productivity or precluding the regeneration of desired species. Examples of negative effects of logging include soil compaction, damage to standing timber, introduction of invasive species, increased soil erosion and downstream sedimentation, and habitat loss for threatened or endangered species. Obviously we need logging, but we also need a mutually agreed to system that allows logging while protecting important ecological factors.

State 4
Converted State

This state has sites that have been cleared and converted to another land use, which may be considered unfortunate because of the high inherent forest productivity of the site. That very productivity spurred conversion to

agriculture and pine plantations. On the Developed Phase, the possibility exists that high value canopy trees have been retained on the site for aesthetic reasons, however development such as road building, permanent structures and parking areas doesn't allow this. For the Agriculture Phase and Pine Plantation Phase to occur, the pre-existing vegetation is removed down to bare soil. Re-planting to crop species follows, other tillage operations are also required. This changes the nature of the site from "wild" land to "working" land. Agricultural crops include hay and pasture, potatoes and corn.

Community 4.1
Agriculture Phase

Agricultural crops on this site include hay and pasture, potatoes and corn.

Community 4.2
Pine Plantation Phase

This phase is weighted heavily toward older plantations. These sites aren't converted at past rates because it has been shown that naturally regenerated hardwoods are a more sound silvicultural choice.

Community 4.3
Developed Phase

This phase doesn't use a lot of land but the impact often extends beyond the footprint of the development. These impacts involve light penetration, the introduction of invasive species or diseases, and increased development.

Additional community tables

Other references

Attig JW. 1985 Pleistocene geology of Vilas County, Wisconsin. Wis. Geol. and Nat. Hist. Surv. Information Circular 50. 38 pp.

Black MR., Judziewicz EJ. 2009. Wildflowers of Wisconsin and the Great Lakes Region: a comprehensive field guide. 2nd ed. Univ. Wisc. Press 275pp. Curtis JT. 1971. The Vegetation of Wisconsin: an ordination of plant communities. Univ. Wisc. Press. 657 pp.

ECOMAP. 1993. National hierarchical framework of ecological units. USDA Forest Service, Washington, D.C.

Epstein E, Smith W, Dobberpuhl J, Galvin A. 1999. Biotic inventory and analysis of the Northern Highland-American Legion State Forest. Bureau of Endangered Resources, Wisconsin Department of Natural Resources. 263pp.

Faber-Langedoen D, editor. 2001. Plant communities of the Midwest: Classification in an ecological context. Association for Biodiversity Information, Arlington, VA. 61 pp. + appendix (705 pp.).

Grime JP. 1981. Plant Strategies and vegetation Processes. J Wiley and Sons. 222pp.

Kent M, Coker P. 1992. Vegetation Description and Analysis: A Practical Approach. CRC Press, Boca Raton, FL. 363pp.

Kotar J, Kovach JA, Burger TL. 2002. A Guide to Forest Communities and Habitat Types of Northern Wisconsin. 2nd ed. University of Wisconsin-Madison, Dept. of Forest Ecology and Management.

Kozlowski TT, Pallardy SG. 2002. Acclimation and adaptive responses of woody plants to environmental stresses. The Botanical Review 68(2): 270-334.

Mitchell SJ. 2013. Wind as a natural disturbance in forests; a synthesis. Forestry 86:147-157.

Natural Resources Conservation Service. 2008. Hydrogeomorphic Wetland Classification System: An overview and modification to better meet the needs of the Natural Resources Conservation Service. Technical Note No. 190–8–76.

Pielou EC. 1991. After the Ice Age: the return of life to glaciated North America. Univ. Chicago Press, Chicago, IL. 366 pp.

Wisconsin Department of Natural Resources (DNR). 2014. The ecological landscapes of Wisconsin: an assessment of ecological resources and a guide to planning sustainable management. Chapter 14, Northern Highland Ecological Landscape. Wisconsin Department of Natural Resources, PUB-SS-1131P 2014, Madison. 84 pp.

Wisconsin Initiative on Climate Change Impacts (WICCI) 2011. Wisconsin’s Changing Climate: Impacts and Adaptations. Nelson Institute for Environmental Studies, University of Wisconsin-Madison & the Wisconsin Department of Natural Resources, Madison, Wisconsin.

Zobel RW. 1992. Soil environment constraints to root growth. Adv. Soil Science 19:27-51.

Contributors

Mark Krupinski

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

---

14. **Average percent litter cover (%) and depth (in):**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

---

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

---

17. **Perennial plant reproductive capability:**
